

XIV.—During the 21st the high pressure advancing southward over the Lake region indicated that a decided disturbance must exist far to the south. In northern Mexico and in western Texas a slight barometric depression appeared on the morning of the 22d. This depression moved eastward, reaching the Mississippi on the 23d, at which time also pressure was lowest at Yuma. Low pressure continued in the lower Mississippi valley until the 26th, with a moderate and ill-defined cyclonic circulation of the winds and general rains.

XV.—This depression appears to have begun on the 22d, p. m., in northern California, as a cyclonic whirl, between the northerly winds on the coast and the southerly winds in the interior; it moved northward into British Columbia and thence eastward along the northern border of our stations, disappearing on the 30th southeast of Newfoundland.

On the 26th, p. m., as this depression approached Lake Superior the following signals were ordered: Chicago, 26th,

10.30 p. m., warnings of severe local storms for Upper and Lower Michigan.

XVI.—On the 26th, a. m., pressure was still rising in British Columbia and Alberta in the rear of low No. XV, but by the 26th, p. m., had again begun to fall, owing to the formation of low No. XVI which moved southeastward into South Dakota, while low No. XV moved rapidly eastward. On the 28th, p. m., No. XVI extended as an indefinite depression from South Dakota to Idaho, between northerly and southerly winds, but by the 29th, a. m., the western end had closed up and the eastern end was a well-defined low area, central in southern Michigan. It moved eastward, reaching the St. Lawrence Valley on the 30th, sending a temporary depression southeastward into New England. The main center disappeared on the 31st in the Gulf of St. Lawrence.

XVII.—This depression began on the 30th, p. m., in Alberta and on the 31st, p. m., was central in Assiniboia. Its further history belongs to September.

## NORTH ATLANTIC METEOROLOGY.

[Pressure in inches and millimeters: wind-force by Beaufort scale.]

### NORMAL CONDITIONS.

The normal barometric pressure for August over the North Atlantic Ocean, as deduced from international simultaneous meteorological observations taken at Greenwich noon and reduced to standard gravity, is highest, 30.20 in a small region between N. 30° and N. 40°, W. 23° and W. 48°; it is lowest, 29.70 (754), in two small regions (1) north of Hudson Bay; (2) between Iceland and northeastern Greenland. On the Pacific Ocean a similar area of high pressure prevails between N. 40° and N. 20°, and west of W. 140°. From this Pacific area a narrow prolongation extends northeastward to Vancouver Island, giving high pressures to the coast of Oregon. In general, the pressure is low, 29.80 or less, over the entire Polar region north of N. 60°, but is higher in northern Siberia than in northern America.

As compared with July the normal pressures for August are higher throughout the United States, British America, the Polar regions, and Asia, but lower over the Atlantic and Pacific oceans. These changes are such as to indicate that between the 5th and 10th of August the distribution of pressure in the Northern Hemisphere has reached the extreme condition peculiar to summer temperatures, and by the 15th of August has already begun its retrograde movement toward the condition appropriate to midwinter. As these barometric changes are the result of corresponding changes in the general circulation of the atmosphere, whereas the temperatures at the surface of the earth show no such decided thermal retrogression until some weeks later, we must conclude that the seasonal changes take place more promptly in the upper strata of the atmosphere than in the lower, or in other words that the mobility of the upper portion of the atmosphere is greater than that of the lower portion, a conclusion that is entirely in accordance with the well-recognized fact that the lower layer of air experiences various forms of resistance from the earth's surface and the ascending currents of warm air, while the upper layers glide over these with comparatively little resistance. The first effect of the southward motion of the sun is to diminish the quantity of heat received by the surface of the land and ocean in the Northern Hemisphere; this effect is felt in the regions north of N. 60° between June 15 and August 15, more than in the regions to the south of it, and the first result is not so much a diminution of temperature at the surface of the earth as a diminution of the ascending component of the atmospheric motion.

The normal zone of maximum frequency of paths of

centers of low pressure during the month of August passes from some unknown point on the coast of Alaska southeastward to Lake Superior, thence eastward over Newfoundland and northeast to the Faroe Islands, thence eastward into central Russia. The general distribution of pressure indicates that these special areas of low pressure begin as whirls in the upper atmosphere attending the overflow from the high pressure of the Pacific northeastward over Alaska into the low pressure of the Arctic; they are propagated eastward as incidents in the general overflow from the tropical areas of high pressure. The number of such whirls as recorded is less in August and the summer months than in December and the winter months, but this is partly explained by the fact that the whirls occur on the extreme northern limits of our reports and partly by the probability that some of those in the upper layers do not extend down to the surface of the ground with sufficient definiteness to be recognizable on our maps. The other prominent belts of storm tracks are those that pass northeastward through the China and Japan seas and those that pass over the West Indies westward to the Florida coast and thence northeast to Newfoundland. These storms represent whirls that originate in the tropical regions whenever the cold, dry air descending over continental areas, such as China, the United States, Brazil, or northern Africa, has an opportunity to intrude into the moist air of the tropics.

The normal rate of progress of storm centers during August is 26 miles per hour when moving eastward in the northern portion of the United States, 23 miles per hour when moving east over the North Atlantic Ocean, 18 miles per hour when moving eastward through Europe, and 20 miles when moving northeast through the China and Japan seas and the northern portion of the Pacific Ocean. Tropical storms moving westward average 18 miles per hour in the West Indies and 10 miles per hour in the East Indies.

### NORTH ATLANTIC STORMS.

The following paragraphs give some account of the areas of low pressure and strong winds on the North Atlantic Ocean during August, 1894. Daily charts are compiled at the Weather Bureau showing the atmospheric conditions over the United States, Europe, and the Atlantic Ocean, as nearly as practicable at Greenwich noon, and afford a basis for approximating the locations and paths of the more important areas of high and low pressure.

No extensive severe storms were reported during the month of August in the North Atlantic Ocean. The numerous small areas of low pressure that have passed eastward from the North American continent have either filled up or passed to the north of the region covered by our reports. The low pressure of the southern Caribbean Sea has also failed to develop any extensive disturbance. The individual low pressures are enumerated as follows:

A. This was a continuation of *F* from the series for July and was central on the 1st, noon, at N. 58°, W. 15°; 2d, noon, N. 61°, W. 8°; its northeastward motion now changed to southeast and the low pressure was central on the 3d, noon, at N. 56°, E. 5°, and the 4th, noon, N. 55°, E. 8°, after which it disappeared. On the 3d and 4th pressure was low over Scandinavia and northern Europe in connection with the very general depression extending from Hudson Bay eastward to Norway.

B. This was a continuation of No. XIII of the U. S. series for July which was central on the 1st near Lake Superior, and on the 2d over Lake Huron. During the 3d and 4th this passed over Labrador; on the 5th it was central near the Straits of Belle Isle, and on the 6th, noon, at N. 56°, W. 36°; 7th, noon, N. 57°, W. 26°; 8th, noon, N. 59°, W. 11°; 9th, noon, N. 60°, E. 4°; 10th, noon, N. 60°, E. 10°; 11th, noon, N. 66°, E. 18°; 12th, noon, N. 60°, longitude 0°. At this time pressure was steadily diminishing to the eastward as far as the eastern portion of Russia, and so continued until the 15th, while *B* moved northeastward and disappeared.

C. Between the 11th and 12th pressure fell rapidly west of Great Britain, and a depression appeared on the 12th, noon, central at N. 60°, W. 3°; it moved southeast, and on the 13th, noon, was at N. 57°, E. 8°, and the 14th, noon, N. 57°, E. 15°, after which it disappeared.

D. On the 9th a long trough extended from New England to the Straits of Belle Isle, and on the 11th, noon, a moderate depression was central in southern Newfoundland. By the 12th it was approximately at N. 57°, W. 47°; 13th, N. 58°, W. 29°; 14th, noon, N. 60°, W. 10°; 15th, noon, N. 57°, W. 5°; 16th, noon, N. 60°, E. 5°; 17th, noon, N. 65°, E. 15°; 18th, noon, N. 57°, E. 23°; 19th, noon, N. 63°, E. 20°. On the latter date this depression seems to have disappeared in the presence of others that were approaching Norway or developing over the North Sea.

E. This was a continuation of U. S. series No. VIII, which was central on the 14th, noon, in the upper Lake region; 15th, noon, in the St. Lawrence Valley; 16th, noon, near the west coast of Newfoundland, and on the 17th, noon, it extended as a trough from Nova Scotia northeastward, having two special depressions central, respectively, near Cape Breton and about N. 54°, W. 42°. The latter moved northeast beyond our reports. The former depression developed slowly south and east of Newfoundland and had disappeared by the 19th.

F. This appeared on the 20th as an indefinite depression off the middle Atlantic coast, and was a continuation of U. S. series No. XII. It was central on the 21st, noon, in the Gulf of St. Lawrence, and on the 22d, noon, on the coast of Labrador, at about N. 55°, W. 53°. It then apparently moved

northeastward, but beyond the northern limits of our reports, while an area of high pressure, unusual for that region, prevailed on its southeastern border as far north as Iceland and the Faroe Islands. By the 25th, noon, the northern portion of this area of high pressure began to recede southward, but on the 28th, noon, pressure still continued high from the Shetlands westward. Meanwhile an extensive area of low pressure had apparently traveled eastward from Greenland to northern Scandinavia and Russia, where it prevailed from the 26th to the 29th.

G. This appeared on the 28th, noon, as a slight depression at about N. 40°, W. 60°. At noon on the 29th it was central at N. 42°, W. 58°, as a small hurricane, although the highest winds reported were of force 10 only; on the 30th, noon, N. 48°, W. 49°; on the 31st, noon, N. 53°, W. 42°. By this date the cyclonic whirl seems to have been generally broken up.

#### OCEAN FOG FOR AUGUST, 1894.

The limits of fog belts west of the fortieth meridian, as reported by shipmasters, are shown on Chart I by dotted shading. Near the Banks of Newfoundland fog was reported on 26 dates; between the fifty-fifth and sixty-fifth meridians on 16 dates; and west of the sixty-fifth meridian on 8 dates. Compared with the corresponding month of the last six years, the dates of occurrence of fog near the Grand Banks numbered 5 more than the average; between the fifty-fifth and sixty-fifth meridians, 4 more than the average; and west of the sixty-fifth meridian, 2 less than the average.

#### OCEAN ICE IN AUGUST, 1894.

The following table shows the southern and eastern limits of the regions within which icebergs or field ice were reported for August during the last thirteen years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
August, 1882.....	46 50	46 00	August, 1882.....	46 50	46 00
August, 1883.....	43 26	51 41	August, 1883.....	48 00	44 00
August, 1884.....	43 24	48 44	August, 1884.....	47 50	43 50
August, 1885.....	43 48	52 04	August, 1885.....	48 03	42 45
August, 1886.....	48 35	48 46	August, 1886.....	50 00	48 00
August, 1887.....	42 21	49 51	August, 1887.....	48 06	40 00
August, 1888.....	Straits of Belle Isle		August, 1888.....	51 33	55 00
August, 1889.....	43 34	48 38	August, 1889.....	53 00	45 00
August, 1890.....	42 30	50 21	August, 1890.....	50 13	39 10
August, 1891.....	44 07	52 05	August, 1891.....	47 32	42 45
August, 1892.....	46 45	53 00	August, 1892.....	48 43	44 49
August, 1893.....	44 53	49 21	August, 1893.....	46 28	46 02
August, 1894.....	40 43	47 00	August, 1894.....	49 26	44 47
Mean.....	44 15	50 12	Mean.....	48 54	44 47

\* Isolated field ice in N. 58°, W. 40°.

The above table shows that during August, 1894, ice was reported on the 19th, about 24° south of the southern limit of ice for the corresponding month of the last twelve years. The position of easternmost ice for the current month was reported on the 8th, and was about the average eastern limit for August.

The limits of the region within which icebergs or field ice were reported for August, 1894, are shown on Chart I by crosses.

#### TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The distribution of the monthly mean temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart II; the lines are drawn over the high irregular surface of the Rocky Mountain plateau, although

the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.